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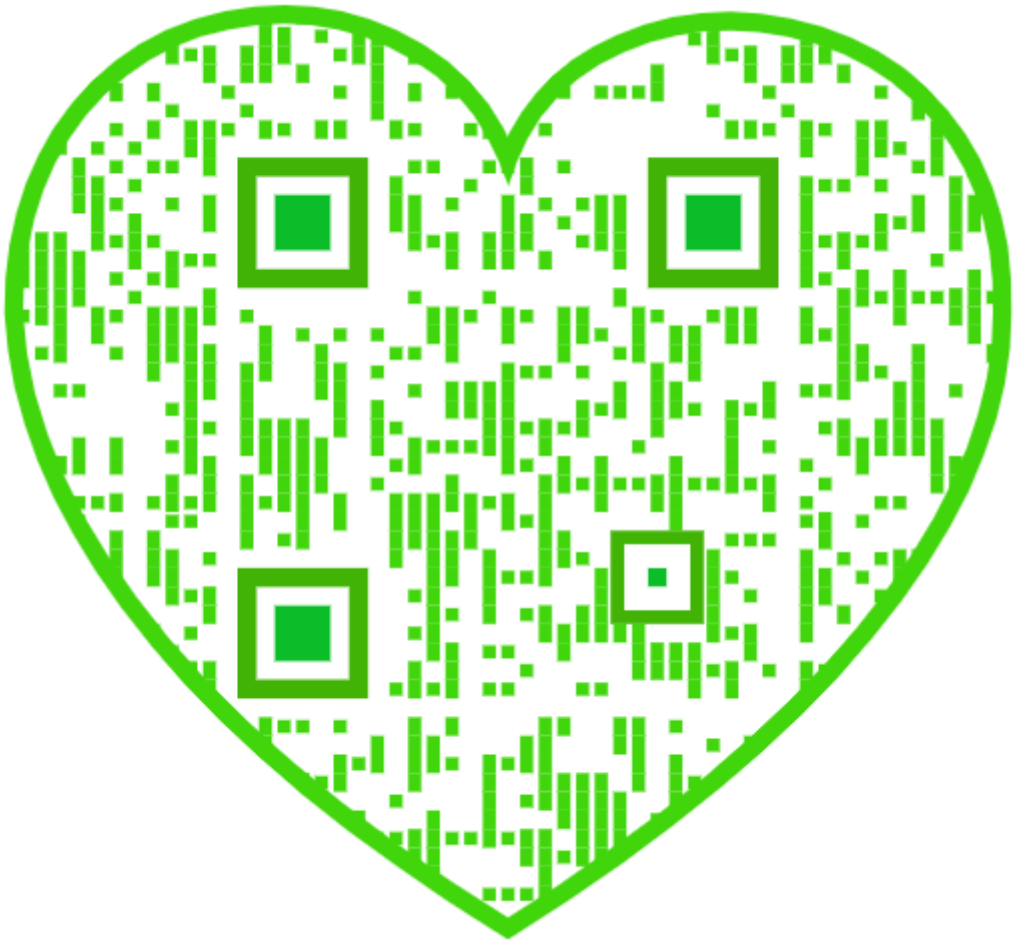

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Beekeeping in Colorado

By NEWTON BOGGS

Office of State Entomologist
COLORADO AGRICULTURAL COLLEGE
Fort Collins, Colorado

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OFFICIAL STAFF

C. P. GILLETTE.....State Entomologist
GEORGE M. LIST.....Chief Deputy
W. L. BURNETT.....Deputy, Rodent Control
NEWTON BOGGS.....Deputy, Apiary Inspection and Investigation
J. H. NEWTON.....Deputy Alfalfa Weevil Control
W. L. MAY.....Deputy, Weed Control
WM. P. YETTER, JR.....Deputy
C. L. CORKINS.....Deputy
E. ROBERTS.....Clerk

BEEKEEPING IN COLORADO

Colorado has over one hundred thousand colonies of bees and produces annually between five and six million pounds of honey. These facts emphasize the importance of the beekeeping industry.

This alfalfa region is entirely different from any other in that we have almost ideal conditions to keep bees in. In the spring the colonies have a long period before the honey flow to build up in. The honey flow lasts until fall and during this time, they have a chance to rear a large number of young bees to go through the winter. Nevertheless, our winter loss averages 10 percent.

HONEY PLANTS OF COLORADO

Sweet clover is found throughout the State and is a valuable honey plant in that it yields as well as alfalfa. Being mostly in waste places, it is not used as hay thereby helping considerably between afalfa flows. Practically all surplus is secured from these two plants, with an occasional crop from **Cleome.** The rosin weed **(Grindelia squarrosa)** yields considerable honey of low grade, which often spoils the grade of the white honey by being mixed in the super. Parsley, prairie clover and **Narcissus** are prairie plants which bees work on freely. Soft maple, dandelion and fruit bloom are important for spring brood rearing. In the mountains are found several early blooming plants which are excellent for building up in the spring. In the Arkansas Valley cantaloupes yield some surplus. **Oreocarya** is a desert plant which yields surplus. Wild currant is found in the mountain canyons. Loco weeds are found in the foothills and yield some honey during May and June. Sunflowers add something to the sum total brought in by the bees.

BEEKEEPING REGIONS IN COLORADO

Very few bees are found in the non-irrigated sections of the State, therefore, divide the beekeeping part of Colorado into six regions. The territory drained by the Platte River; the territory drained by the Arkansas River; the San Luis Valley; the San Juan Basin; the territory drained by the Colorado River Basin; the territory in the northwestern section of Colorado, drained by the Bear River.

In the San Luis Valley there probably are numerous localities that would yield good returns in honey from alfalfa and sweet clover. The latter is grown considerably on waste and seep land. This region awaits the progressive beekeeper.

Figure 1—A Well-Kept Colorado Apiary.

ALTITUDE AND NECTAR SECRETIONS

It is an established fact that flowers at high elevations and high latitudes tend to secrete nectar more freely than in opposite situations. Dr. E. F. Phillips and Dr. J. H. Lovell have reported a great deal of evidence pointing to a more profuse nectar secretion at higher elevations. A beekeeper at Grand Junction reported to the author of the American Bee Journal in June, 1919, that while three of his apiaries were getting barely enough nectar to keep them alive, three others 1800 feet higher and 35 miles away had filled the supers and he was extracting a good crop. Some of the largest crops in the State have been reported at elevations of 5,000 to 7,500 feet. In some of these locations over 300 colonies of bees have been kept in one apiary and a high average secured. At the higher elevations we tend to get a lighter colored and a somewhat better quality honey.

ADAPTATIONS OF BEEKEEPING PRACTICE FOR THIS REGION—FALL PREPARATION

We have nearly ideal conditions in the fall for the colonies to have plenty of young bees to go through the winter, in that we have a flow lasting to about September 15, and sometimes until the 1st of October. But in order to have the largest number of young bees for winter, the beekeepers should see that every colony has a vigorous young queen introduced about August 1st. The queen should have all the empty worker comb space she needs for egg laying throughout the fall. She should be capable of keeping one ten-frame Langstroth hive body at

least nearly full of brood almost until frost. Many beekeepers, especially comb honey producers, make the mistake when they take off the supers before the end of the honey flow by not putting on hive bodies in place of the super. Their aim is to obtain plenty of honey in the brood chamber for winter stores, which is important, but no more than having a large force of young bees.

Young queens introduced in the fall greatly reduce the number of failing queens in the spring, when a good queen is needed most.

Provide Adequate Stores: While rearing brood heavily in the apiary a colony will consume honey very rapidly. It is estimated that a colony of bees that has an equivalent of 12 Longstroth frames of brood in the hive by June 15th, will consume at least ninety pounds of honey from the time of the first killing frost in the fall to June 15th of the next year.

The weather during the spring is frequently unfavorable for bee flights for long periods of time, and also for nectar secretion. To make the bees independent of the weather, let's meet nature half-way and provide an extra hive body (about 45 pounds of honey) full of honey, to be placed on top of the brood chamber the previous fall.

In order to conserve the energy of the bees, we should provide protection in the fall at the time of the first killing frost. All honey coming into the hive stops, causing the colony to cease brood rearing. At this time the bees are the quietest of any period of the year. The disturbance incident to putting on insulation does not do them any harm. After this the beekeeper should have no occasion to open the hive until spring.

If packing is delayed until late, it may do far more damage than to leave the bees unpacked. A colony of bees that is generating heat in response to low temperature is considerably disturbed by the manipulations during packing and the temperature of the inside of the cluster is promptly raised. Frequently, if bees are packed too late the cluster temperature is raised to brood-rearing temperature, the queen begins to lay eggs, and brood rearing is usually continued through the winter unless it results in the death of the colony. Many beekeepers pack their colonies in December with most harmful results.

Time for Unpacking: If the bees have been properly prepared the previous fall, with a young queen, plenty of stores and well packed, the beekeeper rarely has any reason for opening the hive until spring is well advanced. It is best to leave the insulation on until the bees need more room, which will probably be about June 1st, on the weaker colonies somewhat longer.

Methods of Packing: The exact matter of packing is not especially

important provided insulation is provided on all sides including the bottom. If colonies are packed in long rows, there is the objection that the bees drift from the weaker colonies to the stronger ones. If arranged in groups of four (Fig. 2), two facing east and two west, they may be left on the same stand throughout the year and are readily manipulated during the summer.

Figure 2—A Four-colony Winter Case.

There are several methods of providing extra protection to the colonies for outdoor wintering. It is hardly possible to describe even briefly any one plan in detail in this short article.

Too much value can hardly be placed on a good windbreak. Evergreens so placed as to break the wind from the north and west are very good. If these can not be provided, the apiary should be placed in a gulch on the leeward side of the hill, or in a grove of trees. Too much reliance should not be placed in buildings as windbreaks, for they often serve to divert the wind slightly..

Having put the bees away for the winter in good condition the beekeeper can next look forward to the coming of spring and the resumption of activity again. If the details have been attended to properly one need have little fear for the bees coming through the winter in good condition and ready for the work of the season.

SPRING MANAGEMENT

The outstanding thing in the spring is to provide the conditions necessary permitting the bees to get the maximum crop and be ready for the honey flow. All the work which occurs in the spring should have been done the fall before.

Plenty of Stores: If there has not been enough honey left with the colony in the fall provision must be made to feed the colony in the spring a good syrup made from two parts of water to one of granulated

sugar. A simple feeder may be made from a friction top can by punching with a nail a few holes in the center of the cover. Fill the can with warm syrup and place it bottom up over the hole in the inner cover. Place an empty hive body on to protect the feeder. Place the cover on the super. The syrup should flow from the can fast enough to be taken up in from twelve to twenty-four hours.

Plenty of Room: Remember to give your queen plenty of room for brood rearing. Many good queens become honey bound during the dandelion flow. Avoid this by putting on an extra hive body as soon

Figure 3—A Shop for Retailing Honey. In this way much honey can be disposed of locally to a good advantage.

as conditions seem to warrant it. A good queen should brood in twelve frames just before the main honey flow.

Protection: Do not be in a hurry to remove the winter packing. Some beekeepers make the mistake of removing the packing in April. If bees were put in their winter quarters in proper condition they should not be unpacked until about the time of the last killing frost. If for any reason it seems necessary to open up the brood, be sure to do it on a warm day when the bees are flying freely.

Water: Bees use considerable water during the time of brood rearing. It is a good policy to provide water near the apiary. This sometimes helps to keep the bees from gathering water where spraying has been done.

Robbing: Bees are prone to rob at this time of the year. Take all precautions to guard against this as it may be the means of spreading diseases as well as loss of colonies.

SUMMER MANAGEMENT

If you have had success in bringing your colonies up to their proper strength for this time of the year, you are now facing the problem of preventing all possible swarming, which if not controlled, will render your colony useless or nearly so when it comes to producing a surplus of honey. Swarm control is one of the most important problems of the beekeeper at this time of year. The thing that makes the problem difficult is the fact that the beekeeper is here working against the natural instinct of the bee.

If the colony is strong at the beginning of the honey flow and shows indications of swarming, it may be divided artificially. Some methods of management may call for examination of colonies periodically to cut out queen cells, and to keep queens clipped to prevent swarms leaving, but this entails a large amount of work and even though the queens are clipped, will not prevent the desire on the part of the bees to swarm, nor will it prevent the effort to swarm with subsequent loss of time in honey production.

We should strive to so manipulate the colonies that we may keep the impulse to swarm at the minimum.

The requisites to prevent swarming may be summarized as follows: a minimum of drone comb, ample breeding room, plenty of storage room for honey, young queens, and ample ventilation.

Drone Comb: The use of full sheets of foundation, both in the brood chamber and in super frames will to a large extent do away

with a superabundance of drone comb in the hive. It will pay well to discard such combs completely and wire the frames properly and insert full sheets of foundation.

Figure 5—A colony should have the equivalent of three supers for storage.

Large Brood Chamber: Many apiarists using the eight or ten frame Langstroth hive expand the brood chamber by adding another story for the queen as soon as the first one restricts her laying. Their plan, then, is to restrict the queen from the original brood chamber again to the lower story with one frame of brood at the beginning of the first good flow by means of the queen excluder and placing the remaining brood in the top hive away from the queen to insure the largest possible breeding room under existing conditions.

Ventilation: The entrance should be expanded to suit the needs of the growing colony. The beekeeper should keep well ahead of his bees giving finally a full width entrance. In the height of the honey flow and during intense heat a two-inch entrance is not excessive.

Young Vigorous Queens: It is evident that the desire to swarm is generally stronger in colonies headed by old queens, so that young queens are desirable. A good poultryman seldom keeps a hen over one year old for egg laying. So it is the same with the beekeeper in keeping queens under two years old.

Plenty of Storage Room: The beekeeper should provide plenty of room for the storage of honey, otherwise the brood chamber will become crowded with honey, thereby restricting the queen in her laying. Adding another super when the one below is about half full is the usual procedure.

HOW TO CONTROL FOULBROOD

Ridding Colorado apiaries of foulbrood is almost entirely in the hands of the beekeepers themselves. Through cooperative effort only can the amount of disease be reduced to a minimum. In counties where inspectors are paid and educational work is being carried on, they are getting the better of the disease.

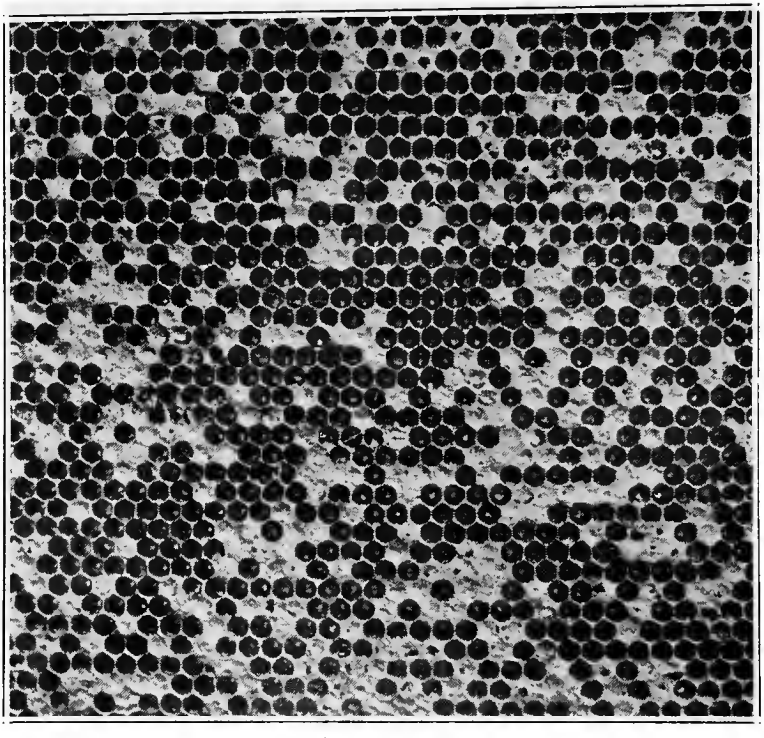

Figure 6—American Foulbrood in an Advanced Stage. Courtesy American Bee Journal.

The three brood diseases more or less common in Colorado are American foulbrood, European foulbrood and sacbrood.

American foulbrood occurs wherever it has been carried either by human agencies or by the bees themselves. As far as the writer knows, European foulbrood in the last few years has occurred only in two localities in this state. It is a disease which should not cause much trouble in the alfalfa region.

Sacbrood is more widespread and occurs during the spring in most apiaries in the State.

Bacteria Cause American and European Foulbrood: White* has clearly demonstrated that the three brood diseases of bees known as American and European foulbrood and sacbrood are caused by bacteria. The bacteria may be isolated and the disease transmitted in the laboratory as well as in the field, sacbrood according to his investigations is a filterable virus.

Each disease develops symptoms peculiar to itself. The only sure way of determining the kind of disease is through a microscopical examination. If the beekeeper finds diseased brood and does not know what it is, he can cut out a sample and send it to the State Apiary Inspector.

SYMPTOMS OF AMERICAN FOULBROOD

In case sufficient numbers of the bacillus foulbrood gain entrance to the alimentary tract of the young bee brood, American foulbrood is bound to result. When these extremely small germs are given to the brood they multiply very rapidly and produce a poison which is fatal to the brood. When the brood dies, the germs do not die, but remain in the decomposing matter ready to contaminate any further brood they may reach. Because of their large numbers, vitality and small size they are easily spread.

Odor: American foulbrood develops the characteristic sickening odor. This odor is distinctive, sometimes called the glue-pot odor, and is strongest in brood dead for several weeks.

Ropiness: Brood that has been dead several weeks decomposes to a coffee-brown mass on the lower side of the cell. In this stage if a toothpick, match or a similar probe be inserted in the mass and drawn slowly out, the mass can be strung out from one to three inches before breaking. In time this mass will dry down and form a scale which adheres to the lower side of the cell wall.

Age: Brood is only infected during the feeding stage. Death usually comes during the last two days preceding pupation or sometimes during the first two days of the pupal period.

Cappings: The cappings of infected brood cells darken and become sunken as a consequence of the decaying matter within. When the time comes for the brood to hatch normally, the attendant bees gnaw a small hole through the cappings to investigate, resulting in the "pepperbox" appearance.

Vigor of the germ: The germ exists in a series of stages, convertible into each other, and called the vegatative condition, the motile

*G. F. White—Sacbrood: Bulletin 431, U. S. Dept. of Agr., 1917.
American Foulbrood: Bulletin 809, U. S. Dept. of Agr., 1920.
European Foulbrood: Bulletin 810, U. S. Dept. of Agr., 1920.

condition and the spore condition. It is in the last of these, in the spore, that the germ is so hard to destroy.

It requires heating for eleven minutes to the boiling point of water to kill all spores. If the spores are mixed with honey it requires thirty minutes of such heating to destroy all. When kept dry at ordinary temperatures the spores are known to remain alive for several years.

Symptoms of European Foulbrood: Larvae usually die in younger stages and before cells are capped over. We sometimes find the cells capped and perforated as in American foul brood. The dead brood does not give off a strong offensive glue-pot odor, except in cases where other putrefying bodies are present. The dead larvae are a grayish yellow at first and later turn to a chocolate brown. They melt down and are found mostly at the back of the cell. The tissues do not string out as much as the larvae of American foulbrood, and when it does string it is of a granular consisteney. The disease is generally more prevalent during the first part of the season.

Treatment of European Foulbrood: It is not necessary to destroy the combs in European foulbrood but remove the old queen and in seven days destroy all queen cells that have started and introduce a young Italian queen, and the bees will generally remove all diseased larvae in that time.

Figure 4—Display, Weld County Fair, 1922. This is an excellent way to advertise.

General symptoms of Sacbrood: In sacbrood the larvae die after the cells are capped and the bees remove the capping or puncture the cells as in American foulbrood. However, there is a difference in that the sacbrood punctures are larger and usually only one. The larvae turns black and curls up, and can be easily removed. When punctured the larvae appears as a granular mass with more or less watery appearance.

Treatment of Sacbrood: The disease at its worst is not very destructive, and when it does make its appearance it affects so few larvae in the colony that it need not cause any great alarm.

HOW FOULBROOD IS SPREAD

Shipping bees: According to the report of the State Entomologist for 1917-18, Bulletin 20, Wisconsin State Department of Agriculture, the spread of American foulbrood from one state to another or over widely separated areas, is due to shipping diseased bees and infected equipment or honey.

Aside from buying diseased bees and shipping them into disease free territory, the buying of used combs and equipment is one of the most dangerous things a beekeeper can do. Generally the beekeeper that has old equipment to sell has lost his bees from disease. Old combs from such sources generally carry disease and should **never be used.**

Second-hand hives and equipment should never be used without first scraping and scorching or washing them in hot lye water.

Spread of disease locally is caused by exposing infected honey to robber bees or interchanging infected combs from diseased to healthy colonies.

Brood-free dry extracting combs from colonies infected with the disease should never be used, as the amount of disease carried is 25 percent.*

Feeding the bees extracted honey is dangerous even though one may not suspect disease in his apiary. If disease is in the locality, one may overlook it until it is too late. It is much better to feed sugar syrup.

Disease in Buildings, Trees and Rocks: In inspection work one is frequently met by the statement that it is of no value to clean up foulbrood in his apiaries as long as the bees in trees, crevices in the rocks, between the walls of buildings, etc., cannot be inspected, as the disease will be redistributed over the area from this source. It is true

*H. F. Wilson, Bulletin 333, "How to Control American Foulbrood" Agricultural Experiment Station, University of Wisconsin.

that bees in these places are a menace, but their number is so small in comparison with bees in hives that it has been found to be a negligible influence.

TREATMENT OF AMERICAN FOULBROOD

Figure 7—Brood stacked over a weak colony to be treated later. Courtesy American Bee Journal.

The treatment of American foulbrood consists primarily in the elimination or removal of the cause of the disease. In treating this disease the aim of the manipulation is to destroy all of the bacteria of American foulbrood by the removal of all infected material from the colony, and in compelling the bees to take a fresh start by building new comb and gathering fresh stores. This is done by brushing the bees from the old combs into a clean hive.

Time of Treatment: The brushing treatment should be given during a honey flow, so that other bees in the apiary will not be inclined to rob.

Operations—1: The colony, in the evening after bees have quit flying, should be moved out of the apiary a distance of at least two hundred feet in a so-called hospital yard and left undisturbed a few days until the bees have marked their new location.

2. Select an empty hive body that is bee-tight to receive the diseased combs, and nail a tight bottom to it. Then place a cover on it.

3. Have a brood chamber containing full sheets of foundation ready. Place an empty hive on this to brush the bees into.

4. Place the clean hive body containing full sheets of foundation with bottom board and queen excluding zinc over the entrance in place of the diseased colony which has been moved back a few feet. The queen-excluding zinc will help to keep the colony from absconding.

5. Carefully remove the frames from the diseased colony and brush the bees in the empty super above the hive containing foundation.

6. **As soon as the colony has been treated remove all infected comb and hives to the honey house, the wax to be melted up and hives cleaned immediately.**

Saving Healthy Brood: If several colonies are being treated at one time, it may pay to stack several hive bodies containing diseased combs, over a weak diseased colony to allow the healthy brood to emerge, thereby strengthening the weak colony. **This colony should be treated in 21 days and all combs rendered into wax.**

Cleaning the equipment: After the bees have been brushed into clean hives, the next step is to prepare the hives for use again. The frames should be boiled in lye water and then while hot dipped in another tank of hot water to clean them off. The covers, bottoms and hive bodies should be scraped thoroughly on the inside, corners, edges, and backs of rabbets, and then washed in a strong lye solution. **Melt up all the combs and dispose of the honey at once.** Some beekeepers go so far as to burn or bury all the combs on the spot.

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